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FOREST SERVICE

BRANCH OF RESEARCH

MONTHLY REPORT

OF

FOREST EXPERIMENT STATIONS

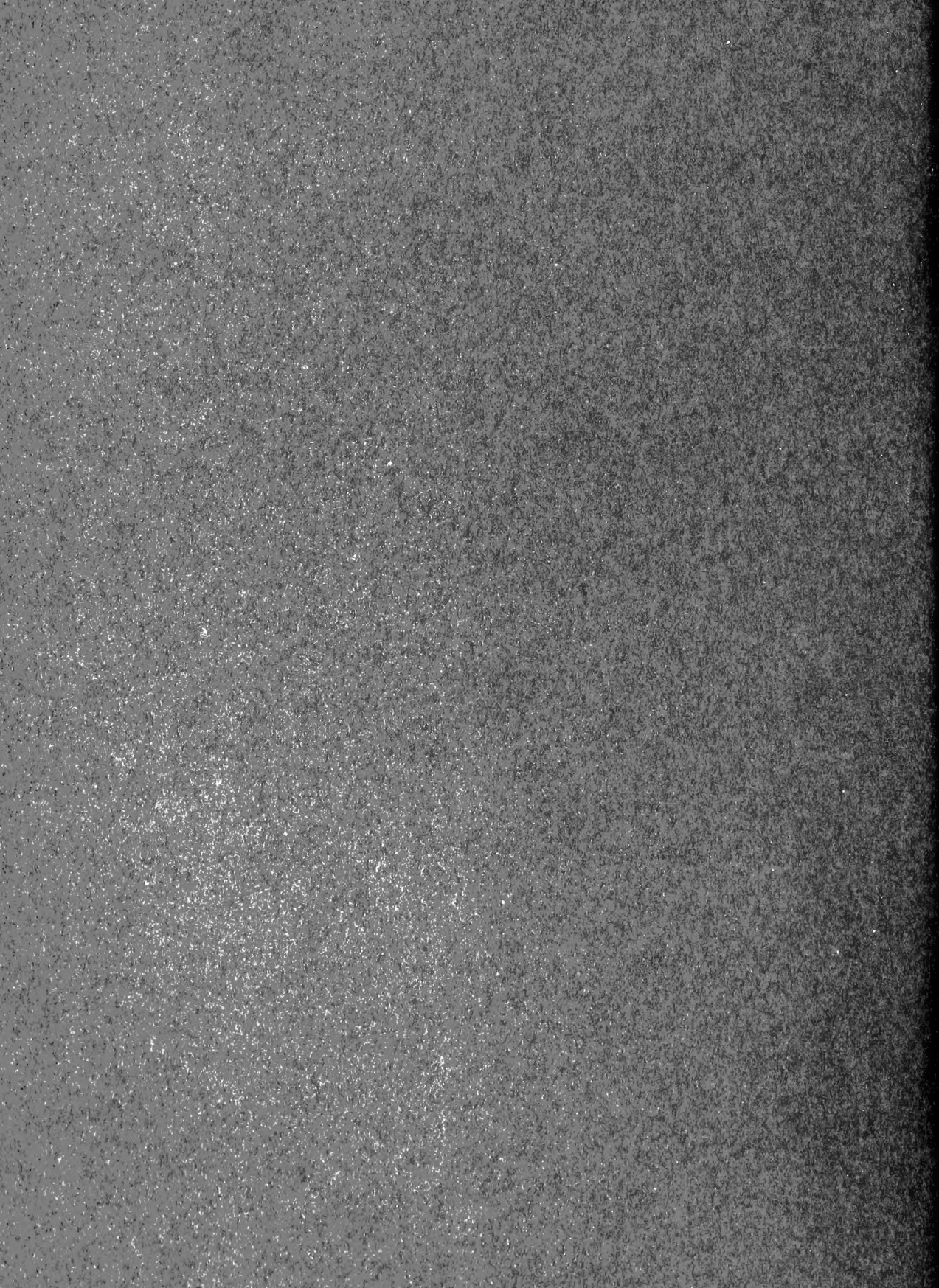
FOREST PRODUCTS

FOREST ECONOMICS

RANGE RESEARCH

FEB 1934





BRANCH OF RESEARCH

February, 1934.

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APPALACHIAN FOREST EXPERIMENT STATION

Fire Weather

Pierce completed and prepared a report on a comparative study of weather conditions in the different units of this fire-weather district. Copies of this report were distributed to the Supervisors and District Foresters. Total rainfall, frequency of rains .05 and over, temperature and accumulated rainfall are the factors considered. Figures are given for 1925, an abnormally hazardous year; 1929, a favorable year; 1933, a year somewhat more hazardous than normal; and the normal for each unit of the district. Comparisons are made between districts and between years. A definite relation was shown between accumulated rainfall and severity of the fire season, while temperatures showed the least relation.

Forest Pathology

In connection with the pine canker disease investigation Diller has established sample plots in slash pine plantings in Troutlen County, Ga., to study rate of growth of diseased trees, development of individual cankers, the spread of the disease in plantings, and the effect of various degrees of pruning on the ratio of infected to uninfected twigs and stems. Lohman and Diller have visited a number of plantations in the naval stores area of Georgia and Florida. Cultural studies in connection with the disease continue at the Asheville laboratory.

Biological Investigations

Consistently unfavorable weather throughout the entire month materially limited Burleigh's field activities. Distributional studies in Western North Carolina and the adjacent edge of South Carolina as far as the upper Piedmont, covered practically all field work undertaken during the month.

Clerical help available through C.W.A. activities, made possible the compilation of a good part of the field notes on the bird life of Georgia, taken over an interval of almost fifteen years from 1920 to date.

Forest Entomology

Huckenpahler continued the inspection of C.C.C. Camps in Virginia, the Piedmont and Coastal Plain of North Carolina, South Carolina, and Georgia; and northern Florida. Very slight damage by bark beetles was found.

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CALIFORNIA FOREST EXPERIMENT STATION

Forest Management -- Pine Region

Methods of Cutting

The growth prediction phase of the methods of cutting study has been carried far enough to show the line of attack which will give the best

(Over)

results. Using the data from 72 subdivisions on the Feather River plots we have made test analyses to determine the variables to be used in the final set-up.

Net growth correlations for a 20-year period furnished useless predicting equations, the high standard errors of estimate completely offsetting the excellent coefficients of correlation and determination. The best of these tests gave the following results: Coefficient of correlation 0.964; determination 0.930; S.E. of estimate 57.5%. The very wide range in growth, introduced by the inclusion of losses, cannot be satisfactorily accounted for even by the use of a "loss" variable.

Analyses of gross growth in cubic feet presents a different picture. The results so far obtained are quite satisfactory. The variables giving best results are: reserve volume of ponderosa pine, Douglas fir, and incense cedar, reserve volume of sugar pine and white fir, average volume per tree in reserve stand, percentage of reserve volume in tree classes 1 and 2. The results of this test were as follows: coeff. of correlation 0.985, coeff. of determination 0.970, S.E. of estimate 18.2%.

In view of these results future work will be concentrated on gross growth correlations. Mortality will be handled as a separate correction factor to be applied to gross growth rates. In addition, a variable for "years since logging" will be included since the Feather River plots show definite variations with this factor.

Planting and Sowing

Lloyd made a trip to the Big Springs brush field planting area, Lassen Forest, on which Horn has been doing rodent control work. About 900 spots were seeded with ponderosa and Jeffrey pine, 118 of which were protected by 1/4-inch mesh wire cones. About 10 seeds were used per spot. The spots are intended to give a comparison of this method with planted seedlings, with which they alternate within rows. The seedlings were planted last fall on strips cleared by a tractor equipped with trail builder.

Forestation

We have previously reported the resumption of experiments on a small scale in the revegetating portions of the denuded "smelter fume" area in the vicinity of Kennett along the Sacramento River. These modest experiments were begun last March with the view of securing information on which to base plans for a major project of land reclamation in this devastated area. The word "resumption" is used advisedly because somewhat similar experimentation was begun by Munns in the same general area in 1921. Evidences of his work are still present in a small tributary of Squaw Creek in the form of walnut and locust trees, the largest of which is now about 20 feet tall. All of the work done by Munns has not been found but it appears probable that the species named are about the only ones which succeeded. However, at the time that Munns did his work the smelters were still in operation and the likelihood is that the species tried by him succumbed to the fumes, to rodents or possibly even to surface erosion.

Resumption of activity was stimulated by two things: first, the report by Wieslander that in the process of his typemapping he had found natural seedlings of ponderosa and knobcone pine growing scattered through the denuded area; and second, by the constant challenge which exists in any large denuded area which is known to have once sustained a good forest cover. Our preliminary experimentation last spring included seed spotting of ponderosa pine, the planting of ponderosa and Jeffrey pine nursery stock and the staking of gullies with native willow cuttings. Minor phases included the broadcasting of various seeds to obtain a cover crop such as mustard and clover, and the drilling into the soil of barley and oats. Soil alteration was also attempted by the use of lime and various fertilizers in cooperation with G. B. Bodman, of the Division of Soil Technology of the University of California. Of these various activities only the first three named gave results which justified their extension.

With the organization of the CWA the Experiment Station secured allocation of 55 men from Shasta County to undertake a large-scale sowing and planting project in the Kennett Area. The project was organized by Ilch as forester and by Pillsbury as engineer, with Conner participating in the original complicated paper work. Roads were cleared and new trails constructed to make the selected area accessible, since the effort had to be confined to territory lying above the future high-water mark of the proposed Kennett Reservoir. To date, some 400 acres have been treated and the work is expected to continue until April 1. The treatment, as in the original experiment, consists in staking all gullies thickly with cuttings of native willow and seed-spotting the inter-gully surfaces with seed of ponderosa pine and Jeffrey pine. Five hundred pounds of each of these species of seed were purchased for the project and smaller quantities of other species such as black oak, live oak, madrone, knobcone pine, toyon, buckeye and black locust are being sown on selected sites. The use of seed instead of plants was, of course, forced upon us for very lack of nursery stock. Since our work of a year ago revealed the presence of rodents in the denuded area, their eradication became a necessary preliminary to the seeding work. E. E. Horn of the Biological Survey responded most generously to our request for cooperation and has kept a rodent eradication crew in the field well in advance of our seeding work. Without this cooperation direct sowing could not have been undertaken, and the project would have had to wait upon the growing of suitable nursery stock.

Regarding the possible success of the venture, no promises can be made. Much depends upon the permanence of the rodent control work and upon the weather during spring and early summer. Pillsbury lately reports that a large percentage of the willows have already begun to sprout and that pine seedlings are appearing in spots along the lower contour trail.

Range Research

The initial phase of the range survey in the San Joaquin Valley and foothills, to obtain data on erosion and rodents, was nearly completed during the month. The results must be compiled before conclusions can be drawn, but the men report general impressions of special interest, including the following:

1. The areas of serious range erosion were observed chiefly in the grassland type, and more commonly at the lower elevations.
2. Areas characterized by accelerated erosion are localized and usually separated by large areas of relatively stable range.
3. Heavy infestations of the California ground squirrel (Citellus beecheyi), the most conspicuous range rodent of the region, were noted chiefly in the grassland and grassy-woodland.

Compilation and analysis of precipitation data from selected stations in the San Joaquin Valley and extending over a 25-year period from 1909 to 1933 inclusive, have progressed far enough to yield two significant graphs:

1. Monthly precipitation departures from the 25-year monthly mean.

Over the 25-year period heavy-rain months show by far the greatest variation from normal, with January in the lead. For a given year these variations range from 2.30 inches below normal to 4.75 above normal. The graph shows further that during the early part of the period studied monthly precipitation on the whole tended to be above normal, while for the latter period it was more often below normal.

2. Cumulated monthly precipitation departures from 25-year monthly normal.

This graph supplements the preceding one by showing major trends in precipitation for the 25-year period. From 1909 to 1916 precipitation increased at an inconsistent rate. Between 1916 and 1922 the trend for precipitation took on a horizontal direction. After 1922, however, precipitation gradually, though unevenly, declined. This gradual decline continued to the end of the record.

Forest Survey - Cover Type Map

With the assignment of 13 CWA workers to the type map project our goal of bringing the office work up to date seemed possible of achievement but for the demobilization of this force now in prospect. However, considerable progress toward this end has been made. Among the accomplishments are:

1. The mounting of over 2000 herbarium specimens including the preparation of labels and of duplicate specimens to be sent to Washington.
2. The careful checking of the sample plot sheets with herbarium specimens for most of southern California.
3. The planimentering of type areas and the preparation of area summaries and tracing vellum correction sheets giving color and species symbols has been completed for the equivalent of fourteen 15-minute quadrangles.

4. The preparation of simplified economic cover type maps in color for the 4-county land use study has been completed for two counties. These maps show (a) timbered areas subdivided into virgin, selectively logged, and even-aged second growth; (b) watershed areas combining chaparral or brushfield areas and dense woodland areas; (c) grazing areas combining woodland-grass and grass type proper; and (d) site index values for all timbered areas as well as for the once-forested portions of the watershed and grazing lands.
5. Preparation of an inch scale map for an area of about 450,000 acres in Shasta County showing the cover types for an area surrounding the proposed \$170,000,000 Kennet reservoir project which embraces a large area denuded by smelter fumes. These data are to be transferred to a relief model being prepared at the CCC camp at Castella.

In addition to the above the vegetative type map project has a joint interest with range research in three librarians who are searching literature for references pertaining to vegetative conditions found by early Spanish explorers and other pioneers, and subsequent activities of man, such as lumbering, grazing, and fire, which have caused changes in the character of the original vegetation. From the information thus obtained we hope at least to partially reconstruct a map of the original vegetation to compare with that existing today as shown by the vegetative survey now under way.

Erosion Control

Northfork

The California Forest Experiment Station's surficial run-off and erosion plots located on the Sierra National Forest, North Fork, California, yielded, as a result of the January 1, 1934 storm, one of the most significant records so far secured from that installation.

The three pairs of North Fork plots, established in 1928 in the Sierra brush type consist of the following: one pair of undisturbed or cover plots, one pair denuded by fire in 1930 and on which the vegetation was allowed to return, and one pair burned over in 1929, 1931, 1932, and 1933, or maintained in a denuded condition. The plots have an average slope of thirty-two per cent; each is 10 feet wide by 108.9 feet long with an area of 1/40th acre.

For the New Year's storm of 2.92 inches rainfall, the cover plots recorded only 4 cubic feet of run-off per acre; the once denuded, 56 cubic feet per acre, and the repeatedly denuded, 1854 cubic feet per acre. The average ratio of run-off for the cover plots as compared to the denuded was 1 to 463.5. The erosion from the plots for the period was none in the case of the cover plots, a trace for the once denuded plots, and over 50 cubic feet per acre for the repeatedly denuded plots.

The apparently small amount of erosion as compared to run-off, from the denuded plots is due to the limited area included. The length of the plots does not permit the run-off to reach an intensity sufficient to produce serious erosion or gullying.

Pickens Canyon Burn

Immediately following the Pickens Canyon fire which burned over some 4830 acres of primary watershed cover late in November, the Forest Service in cooperation with the County of Los Angeles, immediately took steps to control possible erosion resulting from winter storms on the burned area. The plan of flood control consisted of two separate projects; one, the construction of check dams in cooperation with the Los Angeles County Flood Control District using Civil Works labor, and the other the reseeding of those portions of the burn suited to that purpose with mustard seed. It is unfortunate that the unprecedented rainfall of New Year's Eve destroyed or disrupted the work that had been accomplished under these two projects. At the time of the New Year's Eve storm approximately 75 per cent of the area had been sown to red mustard which was beginning to germinate. Had the rain storm been a normal one, at the present time there would be showing up on the burn an excellent stand of mustard plants and with each day past a greater amount of erosion protection would be furnished by these countless numbers of small plants. Gleason reports at the present time after a careful examination of the ground that he is surprised to find more than 50 per cent of the seed still on the burned area. It is true that a great deal of the seed is covered, but Gleason looks forward to seeing it sprout. Also, the Forest Service has purchased an additional 5,000 pounds of mustard seed to resow those areas which have been badly washed and to complete the area which had not been sown up to the time of the flood.

Santa Barbara

Planting of Australian saltbush (Atriplex semibaccata) was commenced in January on the Torro Canyon firebreak. The firebreak has been cleared of brush and old growth and cultivated with a spring-tooth harrow on the most accessible locations at its lowest elevations. The average width is fifty feet and the elevation of the newly cleared portions ranges from 1000 to 2700 feet. Three plots 50 x 50 feet will be set out and marked with permanent stakes at the minimum, medium, and maximum elevation.

These plantings will be made up of five strips, two of which will be planted to one-year old bare-rooted plants, two to potted two-year old plants, and the center strip will be seeded to the seeds of Australian saltbush collected near San Luis Obispo. A strip of about twenty feet wide will be seeded in the center of the firebreak at the lowest and most favorable location. A crew of ten men with one foreman from San Marcos Civilian Conservation Corps camp will do the planting, and the supervision of the work be under Mr. David Ilch.

Fire Research

Organization Planning

This major project under the direction of A. A. Brown is being carried out in the three divisions of detection, communication, and transportation.

For detection planning field work is completed, and it is expected that all compilations and conferences can be finished during March. New dispatcher maps for each forest are being made. This work is being done largely by CWA labor. For this latter work very satisfactory colors have been developed by experiment, which avoid moistening the map with water, yet are transparent. A description of the colors and how they are made is available to any one interested.

In the communication planning Brown is working with Fred Funke of the Regional Office. Plans for six forests have been completed and approved, two more are in the hopper with the objective set for plans for all forests of the region to be completed by June 1.

In the transportation planning there has been time only for limited preliminary work with experiment station participation. Work on a crew basis is planned to start May 1. Brown made a week's trip to Regions 1 and 6 to obtain information that will be helpful in building the work plan for this Region.

At the request of Supervisor Gowen of the Lassen a device was developed to print azimuth circles on fire dispatchers maps. Formerly circles were lithographed on base maps in Washington or transparent overlays were pasted on the map. Neither system was satisfactory, the first being expensive and the second frequently resulting in distortion.

A 5-inch plate was made from a 10-inch azimuth circle. The plate was mounted to a metal base which was fitted with N & S pointers for orientation. When not in contact the plate rides above the base through the action of four springs, one at each corner of the base. A handle with a pointer for properly centering the circle is in the center of the frame holding the plate.

After the plate is inked and oriented the printing is accomplished by pressure on the handle which forces the plate to the surface. A rubber roller is used for inking. The whole device is enclosed in a 6 x 6 x 4 wooden box.

In the hands of an experienced man the results are comparable to that obtained by lithographing. The first outfit cost \$22.50. Later purchase will be about \$5 less.

Forest Products

Wood Requirements

Some high lights of the information compiled by Josephson on this project under Hill's direction:

California's rate of population increase, which for many decades has been considerably higher than that for the United States as a whole, still shows a heavy lead. In the decade 1920-1930 the California rate of increase was 66% as against 16% for the United States. Of the 1930 California population of 5,677,251, 73% was in 156 cities or towns with a population over 2500. This urban percentage of the population has increased fairly steadily, from 48% in 1890. Of the urban population, on this basis, 77% in 1930 was in cities of over 25,000.

While southern California, however, in 1930 was 80% urban, northern California was only 67% urban. The growth of southern California cities has been so rapid as to introduce the difficulty for us that a measurable number of cities now of large size were not even included in census statistics of population and families in 1900, and a few as recently as 1910. All of which is by way of prelude to the fact that the 52% of the total state population which in 1930 was in the eight southern counties of the state is indicating necessity for some revision of the list of cities proposed for intensive study, in order to maintain reasonable statistical balance.

The number of persons per family in this state has decreased from an average of 5.18 in 1890 to 3.41 in 1930, with the trend still downward. The percentage of living units found in apartment houses varies generally in accordance with the size of the city. The state average is 16% of urban families living in apartment houses in 1930. The highest individual city figure is that of San Francisco, 33%, which is undoubtedly due in part to San Francisco's isolation on its peninsula, like Manhattan in New York. Los Angeles, on the other hand, with a population considerably larger than that of San Francisco but with plenty of room to expand, has an apartment house population percentage of only 17. In the heavily urbanized southern California region, the highest apartment house population proportion (and next to San Francisco) is that of Long Beach, 25%; but the southern California region as a whole is low, ranging (except for Long Beach) from the Los Angeles 17% to Pasadena and Santa Barbara at 8%.

In the returns from 12 California cities, the proportion of new living units occurring in multifamily dwellings increased from 11% in 1920 to 50% in 1929, but had decreased again to 12% in 1932.

Parallel with this it is found that in the same 12 cities, from 1920 to 1930 there was an excess of living units constructed over new families to occupy them of 45,733, while from 1930 to 1933 the new families were considerably in excess of the new living units constructed. Returns from four cities show all-wood construction in 1930 to constitute 66% of the total of detached houses, and 39% of apartment houses. Average percentage of homes owned in 1930, for the state, was 43.5, but there was a large variation in individual cities.

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CENTRAL STATES FOREST EXPERIMENT STATION

General

Meetings

The Missouri Land Use Conference held at the University of Missouri on February 27-28 was attended by Baker, who spoke at the evening banquet on recent developments in conservation. Similar talks were given during February to the Buckeye Foresters Club and to the faculty and graduate students of the Department of Horticulture and Forestry, Ohio State University.

On February 23-24 Kellogg attended a meeting in Louisville with District Inspector Bruner and the State Foresters of the region, to discuss plans for ECW work and State forest acquisition.

Lumber Code

Mr. W. W. Fobes, Secretary of the North Central Hardwood Subdivision of the Lumber Code Authority, and E. R. Linn of Hardwood Manufacturers Institute have visited the Station to discuss Article X provisions and administration. The Station has continued its contacts with the public foresters of the region in an effort to stimulate the working out of satisfactory provisions.

Miscellaneous

The Station's annual investigative report for 1933 and program for 1934 has been mimeographed and distributed. A Station file of project and plot records has been set up in the form of summarized reference and progress card reports.

According to an announcement received from the State Water Conservation Board, an aerial survey of Ohio has been approved by the Public Works Administration. The first work on this project includes the mapping of 23 counties in eastern Ohio.

Forest Plantations

Black Locust Volume Tables

Kellogg reports that the International 1/8" board foot volume table has been completed and the charts sent to Washington for reduction. The table is based on 218 locust trees from Indiana, Illinois, and Ohio. In aggregate deviation the chart is 0.22% high. The average percentage deviation of 190 trees is 17.4%.

Black Locust Taper Tables

As time permitted, Kellogg continued work on the taper of locust. He found that the curves of absolute F.Q.'s over d.b.h. by height classes arranged themselves in a regular order, which was disturbed only by the misplacement of

the 50-foot curve and an overlapping of the higher values of the 70 and 80-foot curves by the 60-foot curve. This ties in with the observation reported in June-Sept., 1933, that the tapers were found to be smooth and regular for the shorter and taller height classes, but that the 50 and 60-foot classes were most erratic, possibly indicating maximum influence of branches in the crown. After adjustment of curves, the F.Q.'s were found to vary from 0.435 for 2"-10 ft. trees to 0.642 for 11"-90 ft. trees. Adjustment of curves was comparatively easy because slight shifts did not change the values, particularly in small diameters. For diameters of 1, 5, 10, 15 inches, changes of F.Q. of 0.01 alter the diameter at one-half height above d.b.h. by 0.01, 0.05, 0.10, and 0.15 inches, respectively. Some 22 classes were used as guides for the determination of subordinate form quotients.

An analysis of 135 black locust plots shows an interesting lack of relationship between soil acidity and site index. The acidities were measured electrometrically in the field. There is no apparent correlation between site and acidity.

Range of Site Index	Range of p.H.		
	A Horizon	B Horizon	C Horizon
90 - 140	5.1 to 7.8	4.6 to 7.1	5.4 to 6.4
70 - 90	4.6 to 8.0	4.6 to 8.1	4.9 to 7.4
50 - 70	4.8 to 8.0	4.9 to 8.2	5.3 to 8.0
35 - 50	4.8 to 7.0	4.8 to 8.2	5.0 to 8.0

Locust Borer Investigation

Hall and Wilford spent practically the entire month of February supervising and assisting the ten-man field crew engaged in establishing borer control plots on the experimental area near Cambridge, Ohio. In addition to the plot work, a careful analysis was made of the stems and limbs of the locust trees cut during the operation. Each stem was cut into 18-inch sections, and these were split and examined for borer emergence to determine the class of trees and the portions of trees which are the largest borer producers. Limbs were examined to determine the numbers of borers produced in comparison with the stem sections of the tree.

Numbering Trees

A new method of numbering plot trees with the use of a spray gun attached to a pint mason glass jar was tried out with a considerable degree of success. This gun is operated by a portable 5-gallon compressed air tank, the air of which is supplied by a hand pump. Two men can operate this outfit very advantageously, one man operating the pump and carrying the tank and the other man operating the spray gun and making the numbers.

By using this method it is not necessary to shave the bark of the tree because the spray gun forces the paint into all the crevices of the bark. By the use of this outfit, it is possible to number from 60 to 120 trees per man hour, the number depending to a large extent upon the character of the trees. Those with comparatively smooth bark can be numbered about twice as rapidly as those with rough, deep furrowed bark. A rough check was made on this method by numbering one plot by hand, where it was necessary to smooth the bark first, and by this latter method it was possible to number only about 20 trees per man hour.

Farm Woodland Management

Day has assisted Diller in the analysis of the field data collected last summer on the environmental factors influencing the establishment and survival of seedlings in pastured woodlands. Probably the most interesting result of this study is the much lower moisture content found in soils of grazed woodlands, as compared with either ungrazed woods or open fields.

Whereas loss of water through transpiration is high in the ungrazed woods, there is relatively little loss from soil evaporation. In open fields, transpiration is at a minimum but evaporation is high. In the open wooded pasture, both transpiration and evaporation are high. This combination appears to be the principal controlling factor preventing successful rehabilitation of over-grazed woodlands in the Open Park and Final Stages.

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INTERMOUNTAIN

On February 15th the Intermountain Station, together with the Regional Office of Region 4, realized the peak of their ambition of long standing, the ambition to possess an office building of their own with ample room for everyone. So great was this obsession, or perhaps it was a presage of overtime to come, that the moving process began in the middle of the night and continued without cessation for fully forty-eight hours. Needless to say, all research work ceased during this period although time studies might well have been taken on the minimum time required to transport a desk from the Hotel Ben Lomond to the top floor of the Forest Service building.

We are now comfortably installed, however, and join with Region 4 in extending a cordial invitation to all forest officers to visit us in our new quarters and to see what we think is the last word in public office buildings. Incidentally Ogden experienced an earthquake the 12th of March which shook things up considerably but didn't faze the building - speaks well for its construction.

Civil Works

An accumulation of office records and field data have literally melted before the mass attack of this Station's 25 CWP skilled and semi-skilled compilers. Field data of the desert range survey have been compiled and set up

for correlation. An extremely large number of quadrats for a period of years have been compiled and summarized to date, major plots have been summarized to date, snow recession maps have been planimetered, data on the public domain have been compiled and comparisons made to show change in vegetative cover and forage-acre factor. A large accumulation of plant specimens has been mounted preparatory to sending out to branch stations, and model relief maps are being constructed for a number of quadrangles. If the project continues long enough all field data will be compiled and summarized and the slate will be clear for Resnira to continue on.

In addition to the office project, a crew of 30 men has been employed under the Civil Works Program on and near the Boise Basin Experimental Forest. The work consists of intensive roadside fire hazard reduction, stream channel control, minor road improvements, and firebreak construction.

Forest Management

The measurements of permanent sample plots in the ponderosa pine methods-of-cutting study are being compiled and analyzed. Three 5-acre plots on the Payette Forest were established and cut over by the seed-tree method in 1931 and were remeasured in 1918, 1926, and 1931. A few preliminary figures on growth and changes on these plots are as follows (all on 1-acre basis):

Original volume before cutting	18,380	bd.	ft.
Removed by cutting, 1913	15,196	"	"
Reserve volume, 1913	3,184	"	"
Volume in 1931, net	5,570	"	"
Average gross annual increment	156	"	"
Average annual losses	20	"	"
Average net annual increment	136	"	"
Average net annual increment	28.7	cu.	ft.

Annual diameter increment, per tree0.24 inch.

These growth rates check rather closely with those determined by previous estimates and measurements in such partially cut stands.

The number of trees above 3.5" d.b.h. has increased from 17.2 in 1913 to 85.7 per acre in 1931 as a result of the growth of advance reproduction given protection at time of logging. Records of subsequent reproduction are incomplete, but indicate a very low rate of establishment since 1913.

Spring-Fall and Desert Shrub Ranges

Grass, the Chief Forage Injured on Deteriorated Spring-Fall and Winter Ranges

As shown in the Monthly Report for December, the average decrease in forage value on public domain ranges since settlement has been approximately twice as great as the average decrease in plant cover. The explanation of

this lies in the two facts (1) that grass suffered a greater decrease than did less palatable range forages and (2) that in some areas there was an appreciable replacement of more valuable forage by shrubs of low palatability.

The decline in total plant cover on the sagebrush-grass spring-fall ranges has been 20 to 35 per cent with an average of 27 per cent and on the desert shrub winter ranges 33 to 40 per cent with an average of 36 per cent. As measured in forage value, however, the average deterioration was 67 per cent on the sagebrush-grass ranges and 61 per cent on the desert shrub ranges.

Correlation coefficients were calculated between the decrease in forage value and the decline in perennial grasses of numerous units in each of the sagebrush-grass regions and in two desert shrub regions. Each line or grid-iron of plots, consisting of 5 to 40 plots, was regarded as a single case in building correlation tables. The coefficients of correlation as shown in Table 1 were found to be really sizable figures, as is also percentage of variability accounted for in the decline of perennial grasses.

Table 1. Correlation coefficients (r) and proportion of total deterioration in forage value accounted for by decline in perennial grasses. (Spring-fall, sagebrush-grass and winter desert shrub ranges.)

Region	Correlation (r)	Variability accounted for - %
Utah	+ .87	76
Elko & Owyhee Counties	+ .81	66
Snake River Plains	+ .91	83
Western Utah Grass	+ .323	11
Western Utah palatable browse	+ .572	33
Central Nevada	+ .890	79

Since the total plant cover decreased less than half as much as the forage value, it is clear that the better forage plants have been more seriously weakened or destroyed. The rate of depletion in grass cover on sagebrush-grass ranges, therefore, has kept almost exact pace with the decrease in forage value and, when correlated by areas, accounted for 66 to 83 per cent of the total forage depletion. In other words, by far the larger part of the forage value on sagebrush-grass range is in the grass, and unrestricted grazing tends to deplete the grass cover rapidly and seriously.

On the winter desert ranges of western Utah, the decline in grass, though showing important relation to deterioration is much less closely related to the decreased forage value than is the decline in palatable browse. The desert areas studied in Utah were largely in or near to the Desert Experimental Range, which is essentially a browse range. The grassy foothills of the desert in western Utah would most likely show a closer relation of grass to forage value, as was the case in central Nevada where long lines of plots extended into the foothills and over the ridges on which grass cover types are found. In central Nevada the correlation coefficient between decline in perennial grasses and the decline in forage value is + .89, which amounts

to 79 per cent of the deterioration in forage value accounted for by the decline of grass.

There was a general tendency for a decrease in the total plant cover to accompany the decline in forage value. In many local areas, however, this tendency was almost entirely hidden to casual inspection by a sufficient increase in the less palatable species to maintain, or in a few cases, actually to increase the total plant cover even when there has been a severe decline in forage value. Two cases from each major range unit which presented an appearance of good plant cover but which in reality showed heavy depletion by wholesale replacement of inferior shrubs are shown in Table 2.

Table 2. Replacement of valuable forage species by unpalatable shrubs which maintains total plant cover in spite of heavy decrease in forage value.

Region	Percentage change in plant composition				
	Grasses	Valuable Browse	Inferior Browse	Total Plant Cover	Forage Value
Snake River Plains	-61	-1	+25	-3	-43
	-63	+1	+34	-12	-84
Owyhee County	-48	+1	+17	-5	-91
	-59	+2	+11	+1	-61
Elko County	-95	-	+146	+66	-73
	-65	-1	+12	+2	-76
Western Utah	-38	+31	+1	+8	-48
	-44	-	+26	0	-68
Average	-59	+4	+34	+7	-68

In the eight cases cited in Table 2, selected because of the maintenance of a good total plant cover, the forage deterioration was from 43 to 91 per cent with an average of 68 per cent. However, the total plant cover had either been maintained or had increased in 5 cases and had decreased only slightly in three cases, the average of all being a 7 per cent increase. The decrease in forage value was due largely to a decline in perennial grasses varying from 38 to 95 per cent (average 59 per cent). Palatable shrubs also decreased. However, an appreciable increase in inferior browse (chiefly sagebrush) of from 1 to 146 per cent (average 34 per cent) permitted maintenance or increase in the total plant cover. The incidental fact that the new inferior shrubs were in most cases taller plants than the more valuable ones which they replaced, accentuated the appearance of increase to the casual observer.

Management, Summer Range - Great Basin Branch

Project: Artificial Reseeding.

Tests made with crested wheatgrass (*Agropyron cristatum*) on three separate artificial reseeding areas within the oakbrush zone at the Great Basin Branch Station indicate that this species is quite adaptable to artificial reseeding of range lands of this region.

Forage-acre factor estimates on several plots sown to crested wheatgrass, determined on the basis of grazing by cattle, indicate an increase of as much as 46 per cent in carrying capacity as the result of sowing this species.

The following table shows the density of crested wheatgrass obtained with spring and fall sowings at three different elevations in the oakbrush type at the close of the 1932 growing season.

Date of Sowing	Elevation, 8,100'		Elevation, 7,890'		Elevation, 6,900'	
	Oct.	June	Oct.	June	Oct.	May
	1929	1929	1929	1929	1930	1930
Av. Density of native veg.	.35	.27	.47	.41	.42	.51
Av. Density of crested wheatgrass	.07	.18	.05	.14	.05	.04

The spring sowings in the two higher elevational zones appear to show better results than fall sowings. It is believed that there was an advantage in sowing in the spring of 1929 as compared to sowing in the fall of that year. However, the greater density of crested wheatgrass which resulted from the spring sowings in 1929 are due in part to the lower density of native vegetation in the spring seeded areas, to having had one more season for growth and to the subnormal moisture supply during the 1930 growing season in which the plants from the fall seedings had to start growth and which the plants from the previous spring sowings were better able to survive because of already being well rooted.

Fair to excellent seed germination resulted from both sowings, but in many cases rather poor survival of seedlings resulted because of early drought as well as heavy cropping by both rodents and deer. On many of the plots crested wheatgrass was successful in reseeding itself and by 1933 fair to excellent stands were obtained. This indicates that this species has fair ability naturally to reseed itself, in spite of the fact that large percentages of seed were annually harvested by rodents.

Measurements from small sample plots in which plant heights and total number of flower stalks produced were recorded, show that when this plant becomes well established the foliage growth and seed production is good to excellent.

Three principal methods of seeding were tried out, namely, sowing in furrows plowed about 3 feet apart on the contours followed by brushing in with a brush drag; sowing on unprepared ground followed by trampling by sheep; sowing on unprepared ground without further treatment. The best results were obtained on the plowed plots and next best on the plots trampled by sheep.

A few plots in which the crested wheatgrass had become well established were grazed by cattle in July 1931. The plots were estimated in 1931 prior to grazing and again in 1932 to measure any increase or decrease as result of the previous year's grazing. The density of crested wheatgrass was 18 per cent greater in 1932 than in 1931 indicating that this species withstood the grazing very well.

Windbreak Study

Scholz has just completed a draft of a manuscript on windbreaks. This is the outcome of his extensive survey of windbreaks and shelterbelts conducted in North Dakota in 1931.

Forty or fifty years ago considerable planting took place in the prairie regions as a result of the stimulus from the various Timber Culture Acts. A study was made of some 500 of these older groves, along with more recent plantings in seven counties in Eastern North Dakota. On the basis of the survey conducted by the Station it was found that 65 farms out of every hundred have windbreaks, but the average size of these groves is only 1.2 acres. Only 3/10 of 1% of the land area has been planted.

Mortality is rapidly reducing this insignificant area and from 25 to 30 per cent of the trees in the older groves were found to be dead. Little effort is being made to replace dead trees. Of the species planted green ash and aspen were found to be in the healthiest condition; next in order came cottonwood and box-elder; then willow; and finally Carolina poplar.

During the process of the study special reference was given to the examination of soils. The growth of cottonwood increased and that of green ash decreased whenever there was a marked increase in soil moisture. In general, trees did better on the lighter soils than on the heavy ones, due no doubt to the better absorption of moisture by sandy soils.

The early elimination of sod competition by close spacing resulted in more successful plantings under close spacing than under wide spacing.

There is considerable revival of interest for large scale forest planting in the two Dakotas both because of the possibility of Public Works Programs and because of the deficiency of water in the streams and lakes. The report therefore is very timely as it brings out the experience of earlier planting and points out the mistakes to avoid in the future.

Swamp Drainage

Remeasurements of sample plots in the drained swamp at the Dukos Station did not bring out very marked effects of drainage on the tree growth, except in one transect where the growth of trees near the ditch was considerably greater than elsewhere. This merely proves what we have believed for some time, viz., that the drainage of the swamp was not thorough, that the change in the water level must be more drastic and therefore more ditches are needed to produce the effect desired. More complete drainage will be provided.

University of Wisconsin Arboretum

The Station has been actively participating in the plans of the University of Wisconsin for their Arboretum and Wild Life Refuge which is to

be installed at Madison. The Director has been appointed as a member of the committee to formulate plans for this enterprise. We have already submitted a list of species, both native and foreign, which we think might be adapted to the climate of Madison. We have also suggested what we believe is an innovation in this country, that is, we would like to see established not only plantations of individual trees, but also forest types. That means the principal species of the type and in addition associated species together with characteristic under-growth. In this way we hope to establish in Wisconsin, for example, bits of a Douglas fir type or some hardwood type.

Forest Economics

This Station regrets to report that Bernard Frank left the Forest Service on February 8 to take charge of the Forest Investigations for the Tennessee Valley Authority.

CWA and CCC

The CWA and CCC work at the Superior and Chippewa Branch Stations was continued along the same lines, namely, building of fire lines, release cuttings, and hazard removal. Since the project was started the CWA workers have cleaned up over 330 acres of bad blow-down on the Superior. On the Chippewa they have covered 55 acres in release cuttings, 5 miles of hazard removal along roads and 2 miles along the boundary of the experimental forest.

During the month CCC workers have made release cuttings in 20 acres of aspen and have cleaned the brush from 15 additional acres preparatory to planting on the Chippewa. At the Superior branch 30 acres of spruce was released from aspen competition.

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NORTHEASTERN FOREST EXPERIMENT STATION

Research Council

On the day preceding the scheduled winter meeting of the Northeastern Forest Research Council, all southern New England was buried in a blizzard, which was apparently most serious in the immediate vicinity of New Haven. However, a handful of men managed to get to New Haven and an abbreviated program was held during the afternoon of February 21. The interrelation of wild life and forest management was the major topic for discussion. The need for a long time program of research concentrated on experimental areas was clearly brought out. Such studies should aim to work out the seasonal food and cover requirements of the various species of wild life and the wild life ecology of the principal forest types. They should also determine the effect of various forestry measures on game populations and show how measures required for game management might be integrated with forestry operations to meet the specific objectives in the use of the land for any individual ownership.

Lumber Code

The station has cooperated in the formulation of rules of forest practice for the Northeast under Article X of the Lumber Code. During February a proposed revision of the statement presented to the January conference was discussed with men from several of the forest schools in the region and finally considered by a joint committee of the industry and public agencies. The final draft is believed to be workable and if effectively applied will represent very substantial progress. But it was not thought practical to incorporate into the rules any specific limitation of partial cutting nor any specific definition of maturity. Successful application of these rules will rest very largely on the attitude of the state boards set up to enforce them and on the ability of the foresters employed by these boards.

The Northeastern Lumber Manufacturers' Association faces a serious problem in financing the organization which application of the rules of forest practice will involve. The difficulty may be overcome if and when pulpwood, mine props, acidwood, hewn ties, and fuelwood are placed under the Lumber Code. The pulpwood industry, which represents a very large proportion of total production in the Northeast, is however, attempting to set up an independent code. This may further complicate the administrative problems involved.

The status of the products of farm woodlands is another fundamental point which must be settled before effective working of the Lumber Code provisions may be expected in this region. With so large a proportion of total production coming from farm woodlands and with so many subterfuges open for an owner to qualify as a "farmer," if he wishes to avoid complying with Code provisions, the entire system of control will break down unless the products of farm woodlands are subjected to the same treatment as products cut from other forest lands.

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NORTHERN ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

Logging and Milling

The A.C.M. selective logging study continues to occupy most of Anderson's time. This study has shown conclusively that the maximum net return per acre is obtained by economic selective cutting.

Based on clean-cutting a specific area of all species and economic selection of the pine only from this same area, the following comparison of net return per acre is obtained:

Method of cutting	Amount logged per acre		Net return	Net return per
	Net log scale		per acre	M based on
	Ponderosa P. Fir & Larch		\$	net volume logged
Clean cut, all species	13,560	1,670	30.17	1.98
Economic selection, pine only	8,450	0	40.72	4.82

Logging of the low value fir and larch and all small sized pine up to 20", as well as cutting of all pine above this size without regard for defect or quality, is largely responsible for the lower return per acre under clean cutting.

Wage scales, working hours, and cost protection prices established under the code have a direct influence on the minimum sized profitable tree. Recent studies have indicated that in actual practice minimum cost protection prices are in reality only a protection of production costs. On the clean-cut plot referred to in the preceding tabulation the code values that were applied to the lumber yield should have been 17% higher to allow a margin of \$2.50 per M for stumpage and 15% for profit and risk. However, under economic selection the average selling value of the lumber was already increased materially through wise selection of trees for quality. This average selling value only needed an increase of 4% to allow a margin of \$2.50 per M for stumpage and 15% for profit.

Forest Survey

The Forest Survey staff is occupied with plans and preparations for the coming season. Compilation of forest information has been completed on several forests, including the St. Joe, Kaniksu, Selway, Flathead, and Coeur d'Alone. The remaining forests will be completed shortly. Three men are collecting information for Montana and Idaho, and two are engaged on the compilation of type acreages for Benewah County, where the field work has been completed.

Under the present allotment of Nira funds it is expected that field mapping will be done on 3,870,000 acres outside the National Forests in Montana, Idaho, and Washington by October 31. The type information will be brought to Forest Survey standards on four Idaho, three Montana, and part of one Washington forest, for a total of 6,035,000 acres inside the National Forests. Eight hundred forties will be checked for cruise adjustments and 14 man months will be available for office work.

Further plans are being laid to care for possible increases of funds. If an expected increase of \$40,000 (\$25,000 Nira and \$15,000 ECW) is received it will be possible to cover 2,430,000 and 1,535,000 acres more outside and inside the National Forests respectively. Two thousand additional forties will be check cruised and 56 man months will be added to the total available for office compilation. Such a program will render the completion of the Inventory Phase of the Survey in this region easily possible in F.Y. 1936, if funds are available to carry approximately the same organization through the following field season.

Initial training of mappers will be done this year in a training camp. A two weeks training period is planned during which the new men will be given detailed instructions in mapping and cruising according to Survey standards.

Range

Practically all the data on livestock, as well as the vegetative phases of range work, have been compiled. No very significant changes in the range vegetation under three intensities of grazing are yet discernible from these records. The 112 pound weight penalty for those cows on overgrazed range has already been mentioned. One recent conclusion from cattle weights is that returns to the operator who also owns the land are affected in exactly the same way by overgrazing, when computed on the per acre basis as when figured per head. Overgrazing means a loss per acre. Furthermore, this method shows that conservative use gives maximum returns per acre which change to a loss when an unnecessary acreage is allowed.

Weather at Miles City has been of the early fall variety practically all of the past three months. Hurtt spent a few days there recently and discontinued on February 2 supplemental feeding of hay on the range. A total of 170 pounds of hay per head was fed during this 16 day feeding period. A thin coat of ice and snow on the forage during a few days in January necessitated some supplemental feed to the cows on overgrazed range whose average weight was down to 910 pounds as compared to an average of 1028 pounds for the other two lots. The feeding pickup was necessary to avoid starvation loss of some cows on overgrazed range. All lots were fed the same for the sake of uniformity.

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PACIFIC NORTHWEST FOREST EXPERIMENT STATION

General

Favorable weather has permitted CCC work on the Wind River Experimental Forest to progress rapidly. A new water system has been installed in the arboretum, and all buildings are being reconditioned. The 10 miles of road on the Trout Creek Division have been practically completed, and good progress is being made on the seven miles to be built on the Panther Creek Division. Topographic maps and timber statistics for the two divisions of the Wind River Experimental Forest are completed. The maps are on a scale of 8 inches equals 1 mile with a 25-foot contour interval. Information relating to the timber stand is presented in table form and contains a complete inventory of the merchantable timber 16 inches DBH and over, a count of the smaller sizes to 10 inches DBH, a snag tally, site qualities and forest types. A similar survey is now being made of the proposed experimental area at Cascade Head on the Siuslaw National Forest. Weather conditions have retarded the progress of this work, but, considering the season of the year, the accomplishment is satisfactory.

In the series of lectures given by staff members before the School of Forestry at Oregon State College, McArdle made talks on fire research to the Forest Club, discussed fire detection with the protection class, and conducted a seminar on silviculture. Later in the month Matthews spoke to three groups on research methods in studying fire behavior and on various methods being developed for use in estimating fuel inflammability. Isaac spoke before the school on the silviculture of the Douglas fir type and also visited the silviculture class where he discussed seed dissemination and germination. McArdle and Isaac devoted an afternoon each to an inspection of the school forest, giving advice on the various studies conducted by the school. Lodewick lectured on "Predicting Lumber Needs for Portland Residential Construction" and "The Technique of Mill Production Studies". Both of these emphasized methodology information sources rather than results and conclusions. Rapraeger talked on "Motor Truck Logging" and on "Stumpage Transactions in Douglas Fir".

Forest Survey

Basic compilation of type and volume data has been completed for all but two of the 38 counties of the Douglas fir region, and is practically completed for one of these two--Lincoln County. The Tillamook fire of 1933 necessitated additional field work in Tillamook County, which was completed about the first of March. With this done, the work of compiling data for Tillamook County can be commenced. This county, the last to be compiled, should be completed in several weeks.

The county inventory statistics, consisting of a set of 5 tables and 3 charts for each county, have been completed for 27 counties. Stencils have been cut for most of these tables, and they are now being mimeographed and will soon be ready for distribution.

The 1-inch-to-the-mile detailed type maps commenced about a month ago have been completed for 4 counties and 2 national forests. CWA personnel is being used on this job, and if no interruptions occur, the job should be completed in 2 months.

As usual, we have received a number of requests for statistical data from other government departments, private agencies, and individuals. It is significant to note that a number of these requests were for information on the stand of pulp species in this region.

Mensuration

The volume tables for Sitka spruce are now practically completed. These tables together with those for western hemlock, which were finished last summer, will be used in the new growth study of the "fog belt" types. Each set includes: (1) total cubic feet inside bark; (2) board foot, Scribner rule, 16-foot logs to 8-inch top, total height; (3) same for merchantable height; (4) board foot, Scribner rule, 32-foot logs to 12-inch top, total height; (5) same for merchantable height; (6) board foot, Scribner rule, 32-foot logs to variable top diameter (approximately $1/2$ bh), merchantable height; (7) board foot, International rule, 16-foot logs to 6-inch top, total height. All of these tables are definitely needed, since

they gauge the relative intensities of utilization. After a few such studies are made, it may be possible to draw up sets of conversion factors which can be used for computational purposes in changing for one degree of utilization to another.

In constructing the tables for Sitka spruce, breast-high diameters had to be discarded because of the highly variable factor of butt swell. Instead, the diameters at 18 feet above the ground were used. Later the relationship between this diameter and the normal breast-high diameter and the diameter above the swell will be worked out. Four butt-swell classes which can be determined ocularly will be recognized. In actual cruising, the table can be used directly, that is to say, diameters at 18 feet can be estimated.

Forest Insurance

At the end of February about a week's work remained on the type map of the Oregon portion of the Douglas fir region. During February a circular letter was prepared, together with a questionnaire form, both in English and Swedish, with the help of Messrs. Brandstrom and Meyer, which was sent to two Swedish and one Norwegian fire insurance companies which write forest business. It is hoped that some useful information on European methods and experience can be obtained. Copies in English were also sent to Dr. Saari with a request that he pass them on to two Finnish companies. A considerable amount of time was spent checking the Douglas fir region rating schedule and writing the text to accompany it. Some time was also spent on the preparation of a similar schedule for the ponderosa pine region.

Section of Silviculture

Fire studies

To determine at what hours there are peak loads of fire business for lookouts, a study was made of each forest's experience record. Separate analyses were made for man-caused and lightning fires for time of origin of all fires as well as for time of day discovered for those fires seen by lookouts. The peak loads for lookouts apparently come in early afternoon for man-caused fires and in late afternoon for lightning fires. Charts illustrating these facts will be sent to the forests for their information and guidance. Similar material also is being sent each forest for the other analyses recently made of experience records, such as materials first ignited by fires and altitude zones of fire occurrence.

The fire depletion summaries for the Douglas fir region were completed except for Jackson County in the Rogue River unit. An office memorandum was written describing the processes involved in building up these summaries with tables for comparison of results and recommendations for the use of the data. This memo included suggestions for future work. A tentative working plan was prepared for obtaining fire depletion data for the pine region of Oregon and Washington, and CWA workers were started on one of the first phases of the job, that of copying records of all fires 40 acres and over in eastern Oregon counties for the period 1924 to 1932 inclusive.

The hazard indicator stick charts were completed and all these data were put in shape for filing as a permanent office record. The first draft of an article for the Journal of Forestry on our experiences with hazard indicator sticks was written by Matthews.

McArdle and Dr. O'Day, of Reed College, talked to the Oregon chapter of the American Association of Physics Teachers on February 17 on our study of static as an indicator of forthcoming lightning storms. The recently developed visibility meters also were exhibited and caused a good deal of interested discussion.

A shelter for use at fire weather stations was designed and a working model was built. It is planned to have these made in quantity by CCC labor.

Douglas fir silviculture

As the analysis of natural reproduction data progresses, it is apparent that vegetative and artificial cover is of primary importance. The survival of first year seedlings was found to be 7 per cent in the open as compared with 59 per cent on well shaded ground. The shade of logging debris was found to be more beneficial than vegetative shade, since it prevents evaporation and does not compete with the seedling for soil moisture and plant food. The rate of seedling establishment increased as the amount of vegetative cover increased until the ground was 60 per cent shaded. With a further development of shade the rate of establishment gradually decreased. Practically no seedlings were noted to survive after the vegetative cover reached a total of 90 per cent.

Single seed trees left to reseed cut-over lands on national forest timber sales were found to have an exceedingly high mortality. On nine areas studied only 28 per cent of the trees remained standing and alive 8 years after logging.

Ponderosa pine silviculture

The ten different races of ponderosa pine trees growing in our six plantations still have many years of grace left before an accounting will be made to prove which is the most suitable. They have, however, yielded during their establishment period some worth-while planting information, an example of which is found in the progress report for 1933 on the Deschutes National Forest plantation, which has just been completed by Kolbe. The Deschutes plot represents a denuded ponderosa pine site resulting from clear cutting, followed by a severe slash fire. It is the least favorable site on which the ten lots of trees were planted in this project, having a shallow, loose pumice soil which frost-heaves badly in spring, and which nearly every summer about reaches the wilting point in dryness. The records for the plot show that during the past five years, (1) no planted trees were up-rooted by the frost-heaved soil, (2) over nine-tenths of the dead trees died from what may be termed the drought conditions on the plot, (3) the trees have grown on an average less than half a foot in height, (4) in the fall of 1933, the average survival of all lots was 29 per cent, (5) survival percentages indicate that stock grown from local seed and from California is most suitable, and that the South Dakota trees are poorest for this particular site, (6) approximately 18 per cent of the trees on the 10-acre plantation are classified as vigorous; 65 per cent of these vigorous trees are

growing in the shade of shrubs, and (7) the growth of trees is indicated to be benefited by the shade of shrubs only when they are vigorous and able to successfully compete for moisture with the shrub. The average height of vigorous trees is .84 feet (in open) and 1.05 feet (in shade); of mediumly vigorous trees .57 feet (open) and .64 feet (shaded); of trees of poor vigor .42 feet (open) and .39 feet (shaded).

Section of Forest Products

General

Lodewick spent a week in Seattle, during which calls were made at the West Coast Lumbermen's Association, the Washington and Oregon Shingle Association, the Merchants Exchange, the Department of Foreign and Domestic Commerce, the Customs Bureau, the Pacific Lumber Inspection Bureau, the Puget Sound Log Scaling and Grading Bureau, and the College of Forestry. The trip was planned to develop new contacts, to complete our files of statistics, to obtain data on log and round timber exports, and to confer with Professor E. S. Harrar on cooperative work.

Information was supplied the Washington State Tax Commission relative to stumpage and log prices over a period of years.

At the request of the Regional Office, information was compiled as to the number of active logging operations in western Oregon and Washington by annual capacity classes. This information was for use in determining the personnel requirements for administering Article X of the Lumber Code.

Information was supplied the U. S. Army Engineers as to the lumber cut of Douglas County, Oregon for the past ten years. This information was desired to determine the advisability of improving the Umpqua River to the extent that logs might be driven from as far east as Roseburg.

Statistics, Exports

For some time past there have been calls for export data in more detail than those presented in summaries by the Customs Bureau. This is especially true of log exports by species and by port of loading, and for items such as wood burls and cascara bark. Lodewick has spent a great deal of time during the past few months in completing the files of such data and in searching out new sources, and within a few months the available export information on round timbers and minor products should be complete in our files.

Forest Survey

Data were obtained from the files of the Federal Land Bank at Spokane to show the relation between fencing and acreage in different types of farms. Statements as to the value and use of these data must await their analysis. Arrangements have been completed whereby Professor Scudder of Oregon State College is to furnish within the next few months the data from his records, which are desired for the work on rural requirements. Johnson spent some time compiling 1931 cutting depletion in western Washington and Oregon.

Timber Salvage

Rapraeger spent two days in the field with Keen, Beal and Whiteside from the Forest Insect Field Station examining a 1926 burn in Douglas fir where trees which had been killed by fire were now being salvaged. Though these trees had been dead for seven years, there was practically no loss of merchantable volume in the heartwood; the sapwood, however, was a total loss because of decay and insect attack.

Forest Economics

Selective Logging in Douglas Fir

Rapraeger spent most of the month working with Brandstrom on the value increase study and on various other jobs. The completion of a map showing the proposed operating plan for tractor-truck and railroad logging on the Herman Creek Unit of the Umpqua National Forest has attracted a good deal of attention. Men in the Office of Timber Sales, the timber purchaser, and outside loggers and lumbermen visited the office to examine the plan and discuss its general significance as a demonstration area for modern, selective methods of logging. A similar operating plan for a 1000-acre timber sale area at Wind River on the Columbia National Forest was also worked out in detailed form on a map, which has been attached to an office report giving an appraisal and outlining the procedure to follow in carrying out an intensive management plan.

New Public Domain

One-inch-to-the-mile tax delinquency and publicly owned land maps have been completed for Lincoln, Grays Harbor, Whatcom and Lewis Counties. Similar maps for Douglas, Lane, Columbia and Thurston Counties are now in course of preparation. When these are completed, maps of tax delinquent and publicly owned lands for all of the eighteen counties studied will have been prepared.

Compilation of statistical data is completed for tax delinquent and publicly owned lands in all counties studied except Whatcom, with minor corrections to be made in Lane, Lincoln and Columbia. Acreage data are being prepared by classes of intent in ownership and year of tax delinquency for Clallam and Jefferson Counties.

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SOUTHERN FOREST EXPERIMENT STATION

General

The Crossett Lumber Company has offered to deed an area of 1,680 acres of advanced second-growth shortleaf and loblolly timber to the Government to be used as an experimental forest. The Company will retain title to the timber, however, for 20 years during which time as much timber as is now on the land will be removed under the direction of the Southern Station. Plans are being made to use this tract, which is located 6 miles south of Crossett,

Arkansas, in forwarding our Financial Aspects of Private Forestry project, as well as for our forest management projects. A variety of forest products can be harvested, as the Company has sawmills cutting pine and hardwood, a hardwood distillation plant and a Wolmanizing plant for treating posts and poles. A pine pulpwood market is only 20 miles distant, at Bastrop, Louisiana. Plans are being drawn up for an office and laboratory building, a ranger's residence and garage. Roads are being constructed by CWA labor.

Fire Studies

Examinations of the effect of a fire in a loblolly pine plantation, which occurred in April 1933 at Bogalusa, Louisiana, showed that 42 per cent of the loblolly trees, then in their ninth growing season, were dead within a week after the fire and that during the following growing season 21 per cent more died. Furthermore, the survivors grew only 0.5 foot during 1933, whereas unburned trees of the same age close-by made three times as much growth.

Forestation

A quantitative study of ground cover changes was made by Miss Haas and others of the Tulane Botany Department in the Station's Bogalusa spacing plantations. The size, frequency, and abundance of flowering stocks of the grasses and herbaceous species decreased with closer spacing of pines.

Natural Reproduction

Two hundred and twenty-five milacre quadrats were screened by CCC workers at Olustee. These plots are to be used in a study of natural re-seeding, broadcasting known quantities of longleaf seed from the 1933 seed crop.

Financial Aspects

The Station is cooperating with the Bureau of Agricultural Economics and the Board of Regents of the University System of Georgia in a study of Land Use and Community Development for the purpose of profitably utilizing land and improving economic and social conditions of the rural population. In the lower Piedmont region there is much abandonment of crop land and erosion is very severe. Taxes are going unpaid. Although forest trees are coming in on abandoned farm land, the stand is too scattered to produce good quality timber. It appears that most of the land is best suited to forestry and only a small portion is best adapted to agriculture.

An inventory of a 525-acre tract of young pine in South Georgia has been completed, using CWA labor under the direction of T. C. Evans. A study of gum yields will be made, as well as a study of the cost and returns of logging and milling of trees worked-out for turpentine in this area.

Forest Survey

C. H. Coulter has contacted 183 turpentine stills and gum operations in South Georgia. The data collected by him is to be used to supplement and check the data collected on the line plots. About 3 million acres were covered in Georgia and Florida by the pine survey crews during February. It is expected that field work in the naval stores belt will be completed within the next 8 months, if the expanded program goes through.

Field work in the Hardwood Delta Region was discontinued because of high water, with but 65 miles of line remaining to complete the line plot survey on this unit.

Work on the line plot survey of the Norris Dam Watershed in Tennessee will be started soon and one party is already at work obtaining volume table data.

Ecology

A root study of 12-year-old longleaf seedlings growing at the rate of 185,000 seedlings per acre showed that trees with a height of 1.4 inches had roots with an average length of 20.2 inches and lateral roots with an average spread of 15 inches. These lateral roots were poorly developed and practically all were growing within the upper 4 inches of soil with a very few scattered to a depth of 2 feet.

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RESEARCH IN REGION 2

Thinning in lodgepole pine (Mt-103)

Most of Loring's time was spent in transcribing to the office records the field data for the 12 plots established in 1933 on the Medicine Bow Forest, and in preparing stand tables for these plots. Volume tables to be used as the basis for computing the cubic contents of material removed in thinning and left in the residual and unthinned control stands were prepared for each of the three blocks involved. Briefly, the most significant data pertaining to these plots may be outlined as follows:

	:	:	:	Basal:	Percentage of:	:	Average height
Plot	: Spacing Dist.	: No.	: area	: basal area	: Average d.b.h. of represen-	:	
Number	: (feet)	: trees	: left	: left after	: of residual	: tative trees	
:	:	: left	: sq.ft	: thinning	: stand (inches)	: (feet)	

Block N, sapling stands, 1/4-acre plots.

1	7.2 x 7.2	206	1.75	15.4	1.245	8.82
2	5.0 x 5.0	438	5.27	24.8	1.166	8.38
3	Unthinned	5245	12.15	100.0	0.645	9.15
4	9.7 x 9.7	116	0.94	7.8	1.216	9.12

Block O, small poles, 1/2-acre plots.

1	12.5 x 12.5	140	7.41	10.1	3.115	23.14
2	Unthinned	5440	66.83	100.0	1.499	19.04
3	7.4 x 7.4	401	15.92	19.6	2.522	18.12
4	9.8 x 9.8	225	10.72	13.2	2.957	22.69

Plot	Spacing Dist.:	No.	Basal area	Percentage of	Average height
Number	(feet)	trees	left	left after	of representa-
:	:	left	sq. ft.	thinning	tive trees
:	:	left	sq. ft.	thinning	stand (inches)
:	:	left	sq. ft.	thinning	stand (inches)

Block P, large poles, 1/2-acre plots.

1	Unthinned	1009	73.80	100.0	3.661	30.06
2	9.9 x 9.9	222	23.73	30.6	4.427	31.96
3	14.5 x 14.5	102	16.11	25.8	5.369	34.80
4	12.2 x 12.2	145	20.69	26.2	5.114	33.33

With these plots as a basis, it is expected that our knowledge concerning desirable thinning practice will be very definitely augmented.

Thinning in Black Hills ponderosa pine (Mt-101)

Two four-plot series of thinning blocks were laid out within the Nemo Center last fall, the plots being thinned and measured by CCC enrollees under technical supervision. The field data for one of these blocks, Block M, were recently compiled. In a 40-year old stand on an average quality site, the following situation was found to exist after the thinning operation had been completed on the four one-half acre plots:

Plot	Spacing Dist.:	No.	Basal area	Percentage of	Average d.b.h.
Number	(feet)	trees	residual stand	original basal	of residual
:	:	left	(sq. ft.)	area retained	stand (inches)
3	Unthinned	2720	75.55	100.0	2.255
2	7.6 x 7.6	374	16.06	21.2	2.804
1	10.0 x 10.0	216	12.59	19.8	3.268
4	12.5 x 12.5	140	10.70	13.3	3.741

Cutting for pulpwood in Engelmann spruce (Mc-146)

In 1930, four one-acre plots were laid out on the Colorado Spruce Company sale area on Barlow Creek, Montezuma National Forest. The purpose of the project is to determine the effect of commercial pulpwood cuttings on future growth and yield in the Engelmann spruce type and also to establish the most suitable and desirable method and degrees of cutting in order to leave the stand in the most productive condition.

Before the plots could be cut over, however, the company quit and nothing was done with the plots for three years. During the past summer, it was possible to establish a CCC side camp at the old logging camp and to undertake the cutting of the timber on these plots. At the same time, all of the plots were remeasured and individual tree data were procured both for Engelmann spruce and corkbark fir (*A. arizonica*) as the basis for volume

tables for each of these species. These tables were constructed during the past month. With data for two of the plots compiled, information is supplied on the growth capacity of virgin spruce type stands on average quality sites in this particular section of southwestern Colorado. The stand in question is relatively open and uneven-aged. It has a good distribution of age classes, the oldest class being approximately 140 years old on the stump. The following data are based on trees 0.1 inch and over in breast-high diameter:

		: Volume Inside Bark:			
Plot	:Number	:Basal	:Bd. ft.	: Not increment per acre-annum	
Number:	of Trees:	Area	Cu. ft.:(Scribner:	1930-33	
:	:(sq.ft.):	:	:full scale)	Cu. ft.	Bd. ft.
1	1487	192.99	5312	19362	35.7 110.7
2	952	175.02	5088	19292	15.7 48.3
Average	1220	184.00	5200	19327	25.7 79.5

The total losses on the two plots amounted to 49 cubic feet and 198 board feet, practically all of which was included in a 16.4" corkbark fir. The gross (potential) yield for the 3-year period amounted to 33.5 cubic feet and 112.5 board feet per acre-annum.

The individual tree records show that diameter accretion in the largest size class was negligible during the elapsed period since 1930. In view of the relatively large net yield for the entire stand, it appears that stocking falls short of normality, and this hypothesis is substantiated by the wolf-like character of the mature trees. Their removal from the stand, therefore, is desirable from a management standpoint. However, in this particular stand, it would appear that utilization of trees within the pole class sizes for pulp-wood consumption is not silviculturally justified, unless the future management objective is directed toward the production of pulp-wood timber alone. It will be interesting to note whether the results of the study subsequently bear this out.

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